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Docket Management System
U.S. Department of Transportation
Room Plaza 401
400 Seventh Street, SW.
Washington, DC 20590-0001

Reference: Docket number FAA-2003-14449
"14 CFR Parts 1, 91, 121, et al., Enhanced Flight Vision Systems; Proposed Rule"

Subject: Comments on the Notice of Proposed Rulemaking (NPRM) concerning operations
using an Enhanced Flight Vision System (EFVS)

Enclosure: Table of Detailed Comments by NPRM Topic

Dear Sir or Madam:

Gulfstream has reviewed the NPRM in detail and provides the attached table of comments to directly addresses the issues raised in the NPRM. The comments contained within this letter are items Gulfstream deems significant and of a high priority as well as items which represent recurring themes throughout the overall NPRM

The proposed regulations should be implemented with respect to the performance of the individual system and without regard to current systems' technical limitations. While the proposed rule is advantageous for systems currently in use, future technologies may demonstrate even greater performance benefits and the regulations should be developed so as not to automatically preclude the use of these future technological advances. Gulfstream requests that the proposed rule be changed to enable the use of current and future technology based upon satisfactory demonstration of intended function. Specifically, the configuration of the system should have to meet the requirements of its intended function. Certification criteria for future EFVS should be the subject of an Advisory Circular. As an example, the use of a head-up display (HUD) system is required in the proposed rule. Gulfstream believes this language may not stand the test of time and therefore requests that the language be changed to reflect the use of a display and symbology set certified for the intended function.

Gulfstream is encouraged to see that the use of newer technology is allowed to determine flight visibility. However, the need to determine a defined visibility level (with or without the aid of an EFVS system) has been the subject of much debate over the years. It is generally accepted within the aviation community that assigning a numerical value to a horizontal evaluation of flight visibility is not feasible. It is Gulfstream's opinion that the flight visibility requirement in the current 91.175(c)(2) and 91.175 (d) be deleted (regardless whether the aircraft is equipped with EFVS). In their place, a statement should be added that the aircraft should continue the approach if one of the ten items in 91.175 (c) (3) are identified. A restriction to only two of the items identified in 91.175(c)(3), as proposed, may impact the adoption of future technologies, which could well focus on other items currently identified in 91.175(c)(3). Additionally, the FAA's ongoing progress toward harmonization with the Joint Aviation Authority (JAA) would suggest deletion of the flight visibility determination requirement because the JAA does not have this constraint in their regulations.

Gulfstream customers' feedback is that the Gulfstream EVS provides unprecedented improvements in safety. From terrain awareness/avoidance, runway incursion avoidance, and increased situational

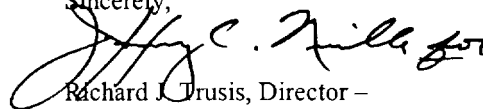
awareness, EVS provides an undisputed increase in safety. In fact, an EFVS system addresses four of the six items identified in the FAA's Safer Skies Agenda for commercial aviation. The system provides a quantum increase in safety levels. However, unless operational benefits are available to Part 135 operators, a business case for the inclusion of the technology in a revenue producing aircraft cannot be made. It is Gulfstream's belief that without an operational benefit for Part 135 aircraft, adoption of the technology will be limited. As a result, the safety improvement provided by an EFVS levels will not be realized. Gulfstream strongly requests the FAA to provide Part 135 operators with the authorization to start an approach if a suitably certified EFVS system is installed and the minimums are less than those required for the published approach. Limitations on visibility and ceiling should be determined by the Administrator based upon the function of individual systems, much the same way that minimums today are defined by the capabilities of the navigation systems aboard the aircraft.

There are many operational and certification issues surrounding Enhanced Flight Vision Systems, especially since there may be differing levels of aircraft integration and intended function. It does not appear prudent to try to address these numerous and diverse issues in an operational regulation. What is needed is Advisory Circular guidance material for the certification of EFVS installations and other vision enhancement systems used for situational awareness only. The FAA's development of certification criteria as well as the adoption of a modified operational rule can only work to enhance the overall safety of the aviation fleet. Gulfstream requests that the proposed rule, incorporating the requested changes be adopted without delay.

Gulfstream Aerospace Corporation (GAC) commends the Federal Aviation Administration on the coordination and issuance of this NPRM. The development of regulation changes to enable the use of enhanced visibility technology affirms Gulfstream's long held belief in the applicability of the technology to increase levels of safety, provide operational benefit and increase aircraft operational efficiency.

If there are questions, or need of clarification in our commentary, please do not hesitate to reach myself at (912) 965-6536 or Mr. Jeffrey Neville at (912) 965-4334.

Sincerely,

A handwritten signature in dark ink, appearing to read "Richard J. Trusis", with a stylized flourish at the end.

Richard J. Trusis, Director –
Airworthiness / Certification
& Data Management

Response to: Department of Transportation
Federal Aviation Administration
14 CFR parts 1, 91, 121, 125 and 135
[Docket No. FAA-2003-14449; Notice No. 03-03]
RIN 2120-AH78
Enhanced Flight Vision Systems
Agency: Federal Aviation Administration (FAA), DOT
Action: Notice of proposed rulemaking (NPRM)

TOPIC	NPRM Reference Location	As Published in NPRM	GAC ¹ Comment	GAC Recommendation
EFVS limited to use with a head-up display (HUD)	Multiple locations within preface text and 14 CFR Part 91.175(m)(2)	91.175(m)(2): (2) . . . are presented on a head-up display so that they are clearly visible to the pilot . . .	The NPRM EFVS discussion in the preface text and the Proposed Rule associate EFVS solely with a HUD. Presentation of an EFVS image can be readily displayed on a head-down display (HDD). Current head-down display monitors provide increased visual clarity and fidelity over that presented on present HUDs. Current regulations allow approaches to approach category III weather minimums utilizing traditional flight instruments mounted on the instrument panel (i.e., head-down). Additionally, during certification testing, numerous approaches and landings (touch-and-go and full-stop) were performed while restricting pilot outside view to the GAC EVS only. Head-down display presentation symbology and methodology continues to progress. The proposed rule should not exclude the evolution of a FAA-certified HDD with EFVS.	EFVS equipment and limitations are specified in the system certification. EFVS HUD references in the preface text should replace HUD with "certified display" and associated text should reflect that the EFVS image may be presented on a head-up and/or head-down display provided the head down symbology meets appropriate certification criterion. The Proposed Rule 91.175(m)(2) should be corrected with the following: "(2) . . . are presented on a certified display so that they are clearly visible to the pilot . . ." These changes will preclude imposing special conditions on equipment certification or requiring another change to these regulations in the near future.

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Flight visibility	Multiple locations in preface text of NPRM and in proposed changes as follows: 91.175(d)(2), 91.175(l)(2) (Concomitantly with 91.175(c)(2))	Paraphrased -- a descent below DA, DH, or MDA, as well as a landing, may not be performed if the flight visibility is less than the visibility prescribed in the standard instrument approach procedure being used.	Visibility determination is readily established in 14 CFR Part 91.175(c)(3) via identifiable airport lighting systems and/or environment. The additional requirement of a pilot quantifying flight visibility (as defined in 14 CFR Part 1.1) with no other means than a subjective determination adds undue burden to the flight crew and no means of substantiation. This flight visibility requisite is especially superfluous when the requirement of Part 91.175(c)(3) has been accomplished. Additionally, continuing the pursuit of harmonization between the FAA and JAA, there is no requirement for the pilot operating in accordance with JAR-OPS 1.430 ² to evaluate flight visibility when descending for approach and landing. The JAR-OPS 1.430 sole visibility requirements for continuing descent below DA/DH or MDA is to discern at least one of the items specified from a list that closely replicates that presented in 14 CFR Part 91.175(c)(3).	In noted reference locations, substitute verbiage to state that descent below DA, DH, or MDA, as well as a landing, may be performed if any the visual references described in 14 CFR part 91.175(c)(3) are discernible.

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<p>Allowance for pilot operating under 14 CFR Part 135 regulations and equipped with EFVS to continue an approach with weather reported below SIAP³ minimums</p>	<p>14 CFR Part 135.225(b)</p>	<p>(b) No pilot may begin the final approach segment of an instrument approach procedure to an airport unless the latest weather reported by the facility described in paragraph (a)(1) of this section indicates that weather conditions are at or above the authorized IFR landing minimums for that procedure.</p>	<p>The FAA, as evidenced by this NPRM, has recognized the benefits of the EFVS. Allowing Part 135 operators to take advantage of EFVS benefits, without compromising safety, should be allowed with regard to initiating an approach with weather reported less than landing weather minimums. Differences in reported weather conditions and the highly dynamic, actual weather conditions are universally recognized. Additionally, the transmissometers in use only determine a referenced "natural vision" visibility and therefore provide no significant data for the operator using EFVS. This transmissometer limitation is especially pertinent for an EFVS that operates outside of the visible frequency ranges of the electromagnetic spectrum. Establishing a defined, reported weather conditions requirement for proposed EFVS operations is crucial for flight planning and operations, but must be determined with consideration of the capabilities and limitations of the reporting equipment and the particular EFVS. As an example, the EVS installed on the GAC G-V and G-IV was certified for visibility credit during approaches to a minimum altitude of 100 ft AGL. At this altitude, the nominal distance to the runway threshold is approximately 910 ft (an approach with a 3° glidepath and with a normal runway point intercept 1,000 ft from runway end). Following this precedence, EFVS usage should be predicated on its (continued)</p>	<p>Modify 14 CFR Part 135.225(b) and associated paragraphs to accommodate authorized operators using EFVS by allowing an approach to be initiated if reported weather minimums are greater than the minimums established for a specific EFVS.</p>

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<p>(cont.) Allowance for pilot operating under 14 CFR Part 135 regulations and equipped with EFVS to continue an approach with weather reported below SIAP³ minimums</p>			<p>capability as determined by the Administrator and annotated in the operator's operation specifications manual, much the same as today where minimums are determined by the equipment on the aircraft (e.g. ILS, VOR, FMS, etc.).</p> <p>Another important aspect of this topic is the proliferation of EFVS – an unequivocal safety multiplier – via an endorsement of an operational benefit. A tangible return on investment is required to encourage installation of equipment that is not mandated by regulations. In other words, a clear operational benefit is necessary for the Part 135 operator to justify investment in an EFVS. Empirical data from GAC EVS flight tests reveal that more than 50% of the approaches could be continued to a landing when weather conditions had been reported below the minimums required for the approach. Increasing the probability of terminating a flight at the intended destination translates into a financial benefit. The benefits are not only those inherent in an increased level of safety. There is also increased customer satisfaction and less fuel consumed (in a holding pattern or in diverting to another airfield) due to reported weather conditions. Allowing the operational benefit of a Part 135 operator to initiate an approach with weather conditions reported as low as 100-ft ceilings and visibility of 1200 ft RVR (or equivalent) is in the public interest because it will promote EFVS installations; thereby increasing the overall level of safety within</p>	

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			the aviation community.	
Required visual references to continue approach below DA, DH, or MDA while using EFVS	Proposed 14 CFR Part 91.175(l)(3)	(3) The following visual references for the intended runway are distinctly visible and identifiable to the pilot using the enhanced flight vision system: (i) The approach light system (if installed); or (ii) The runway threshold and the touchdown zone;	It is not necessary to restrict the visual references required to continue the approach below DA, DH, or MDA when using the EFVS. The visual references listed in 14 CFR Part 91.175(c)(3) are also applicable when using an EFVS. The GAC EVS certification (G-IV and G-V) was predicated on approaches utilizing the visual references in 91.175(c)(3). Also, depending on the type of sensor the approach light luminance may not be displayed on the EFVS presentation and use of the other cues may be necessary.	Change 14 CFR Part 91.175(l)(3) to read: (3) At least one of the visual references listed in 91.175(c)(3) for the intended runway are distinctly visible and identifiable to the pilot using the enhanced flight vision system.
Certification process	<i>Certification process</i> paragraph in preface text	[Entire <i>Certification process</i> paragraph]	Concur with intent of paragraph (exception of HUD is discussed in this table). Expeditious development of certification processes and regulations needs to be pursued and issued. Technological development in the enhanced optics field is progressing at a rapid pace and established certification processes and regulations allow an efficient certification plan.	Strongly encourage a continued, concerted effort on developing EFVS certification regulations

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Minimum altitude for EFVS usage during approach and landing	Proposed 14 CFR Part 91.175(l)(4)	(4) At 100 feet above the touchdown zone elevation of the runway of intended landing and below that altitude, the . . .	Dictating an absolute altitude restriction inhibits the incentive to advance optics technology to a level at which weather obscurations will be transparent to the EFVS. Providing latitude for EFVS minimum altitude usage precludes additional changes to the regulation in the near-future or imposing special conditions on equipment certification. Current EFVS technology allows safe operation below the previously established (14 CFR Part 91.175(c)(3)) 100 ft minimum altitude; however, current certification processes limit the usage. For comparison, present Category II and III ILS approaches are being conducted using head-down displays without the advantage of even having a HUD. The minimum altitude limit for operation with an EFVS should be predicated on the specific equipment installed and certified by the FAA (or approved by the FAA for foreign-registered aircraft).	Change the wording of 14 CFR Part 91.175(l)(4) to read: (4) At and below the minimum altitude at which the EFVS was certified or approved by the FAA, the . . .

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Clarifying use of EFVS during Category II and Category III ILS approach procedures	<i>Category II and Category III ILS approach procedures</i> paragraph in preface text, first sentence	This proposed rule would not allow the use of an EFVS for Category II and III ILS approach procedures.	As written, this sentence prohibits the use of an EFVS while performing a Category II or Category III ILS approach. This wording is assumed to be in error because it is implausible that a conscious decision was made to exclude the use of an EFVS during an approach that must be performed during atmospheric conditions in which the EFVS may provide the benefits described in the NPRM. The intent of the referenced sentence is not clear. Prohibition of an EFVS, which is inherently a safety enhancement, decreases the flightcrew's situational awareness.	Clarify the intended usage of a certified EFVS during a Category II or III ILS approach. Allow the EFVS to be operated during Category II and III ILS approaches.
Deletion of Proposed 14 CFR Part 91.175(m)	Proposed 14 CFR Part 91.175(m)	[The entire 91.175(m) including all subparagraphs]	The proposed 14 CFR 91.175(m) does not conform to the objective of 14 CFR Part 91 – General Operating and Flight Rules. The information presented is valuable with respect to certification, but is not appropriate in Part 91. The definition in Proposed 14 CFR Part 1.1 is adequate from an operational viewpoint.	Remove Proposed 14 CFR Part 91.175(m) in its entirety.
Synthetic vision	Multiple locations within preface text and Proposed Rule	[Various references to synthetic vision and synthetic vision systems]	Concur with current FAA position on progression of synthetic vision systems operational procedures.	Strongly encourage a continued, concerted effort on developing operational procedures and certification requirements for synthetic vision systems.

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Reference to the pilot's viewing position with respect to the head-up display	Proposed 14 CFR Part 91.175(m)(2)	(2) . . . are presented on a head-up display so that they are clearly visible to the pilot flying in his or her normal position and line of vision and looking forward along the flight path:	A pilot's normal seating position may not coincide with that required for the pilot's eyes to be at the position at which the cockpit equipment was designed and certified. This is especially imperative for optic systems, such as the HUD and EVS displays that require alignment from a specific reference point (i.e., the design eye point) to preclude parallax errors.	Correct part 91.175(m)(2) to read: (2) The EFVS sensor imagery and aircraft flight symbology (i.e. at least airspeed, vertical speed, aircraft attitude, heading, altitude) are presented on a head-up display so that they are clearly visible to the pilot viewing from the design eye position and looking forward along the flight path:
Terminology changes for precision approach, non-precision approach, APV, CAT I approach	Multiple locations within preface text and Proposed Rules 14 CFR Part 91.175, 121.651, 125.381, and 135.225	[References to precision approaches and non-precision approaches]	In accordance with the recently published AC 120-29A, <i>CRITERIA FOR APPROVAL OF CATEGORY I AND CATEGORY II WEATHER MINIMA FOR APPROACH</i> , dated August 12, 2002, terminology for approach categories have been changed. A Category I approach is any approach that has a DA/ DH of not less than 200 ft AGL and a visibility requirement of not less than ½ statute mile. The reference to precision and non-precision approach is no longer applicable and the terminology has been redefined. Conforming to a common terminology, as presented in AC 120-29A, provides additional clarity in the regulation.	Make appropriate changes in the NPRM with respect to conformity to the accepted approach procedure terminology as defined in AC 120-29A.
Operation of an EFVS with respect to the visible frequency range of the electromagnetic spectrum	Preface text, last sentence of the Background paragraph	The proposed amendment would provide operational criteria for the desired function of an EFVS, which operates outside the visible portion of the electromagnetic spectrum.	An EVFS may not be limited to operation outside the visible frequencies of the electromagnetic spectrum (e.g., image intensifying (I ²) systems). This system restriction is omitted for the proposed definition of EFVS in 14 CFR Part 1.1.	Disregard the last phrase of the referenced sentence, “. . . which operates outside the visible portion of the electromagnetic spectrum” and allow the proposed EFVS definition

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				provide the description.

- Notes:
1. GAC - Gulfstream Aerospace Corporation
 2. JAR-OPS 1 Subpart E, Appendix 1 to JAR-OPS 1.430, Aerodrome Operating Minima, subparagraphs (b)(3) and (c)(3)
 3. SIAP – Standard Instrument Approach Procedure